Northern Rhodesia

Department of Agriculture

ANNUAL REPORT
for the Year
1957

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Department of Agriculture

ANNUAL REPORT FOR THE YEAR 1957

PART I.—AGRICULTURE IN THE TERRITORY

INTRODUCTION

This report is concerned mainly with African agriculture which has enjoyed a satisfactory year. In all parts of the country, but particularly in the Eastern, Southern and Central Provinces, African farmers are turning increasingly from subsistence production to commercial farming, a change which it is a function of the Department of Agriculture to facilitate whilst ensuring the conservation and sound development of the Territory's natural resources.

2. The advantages to the territorial Department of Agriculture in being able to concentrate upon the special problems of African agricultural development consequent upon the transfer of control of European agriculture to the Federal Government are becoming apparent, and considerable progress with betterment schemes has been made during the past year: there is, however, undoubtedly a loss of stimulus to the department which was provided in the past in dealing with European agricultural affairs.

3. Maize has continued to be the most important source of African farming revenue on the line of rail, and groundnuts in the Eastern Province: alternative cash crops are needed and there are encouraging signs of a revival of the Burley tobacco industry and of the expansion of Turkish tobacco growing in the Eastern Province and in other parts of the Territory.

4. There has been a welcome reduction in political opposition to measures designed for agricultural betterment. The co-operation of the native authorities, so vital to success, is improving but still leaves much to be desired in some parts of the Territory. African farmers on the line of rail are showing an increasing interest in mechanisation: the number of African-owned tractors operating in the Central Province has increased during the year from fifty-three to 105, this development is introducing problems of soil fertility maintenance due to the sale of cattle with which to make the original purchase and to meet running expenses.

5. Land use surveys as a basis for planning continued to be an important feature of the work of the department. The slowing down of the survey in the Plateau Tonga area around Monze in the Southern Province, due to political interference, was disappointing because this area is greatly in need of planning.

6. Agricultural shows have become an important feature of the farming year in most parts of the country. The Lusaka Show of the Northern Rhodesia Agricultural Society held at the beginning of August was quite outstanding in every way: it is gratifying to record that the Department of Agriculture won a handsome silver bowl, the floating trophy presented for the first time in 1957 by the Lusaka Chamber of Commerce and Industry for the best Government stand at the show.

7. It is with the greatest regret that the untimely death is recorded of the Member for Agriculture and Natural Resources, Mr. William Wroth, O.B.E., in May, 1957: under Mr. Wroth's sympathetic guidance considerable progress had been achieved. It was fortunate for agriculture that Mr. H. A. Watmore, C.M.G., was available to take over this important portfolio.

CROP REPORTS

Season 1956–57

8. Although rains were below normal they were generally well distributed throughout the Territory, and a fair amount of sunshine was recorded during the growing season. Crops were everywhere abundant except in parts of Barotseland, where damage resulted from abnormal floods of the Zambezi River.

Maize

9. Maize continues to be the most important food crop of the Territory, a total of 2,075,595 bags of 200 lb. net weight was delivered to the Maize Control Board during the 1957 intake season. This was an all-time record. European farmers produced 1,176,000 bags, and 899,256 bags, or just over 43 per cent. of the total, were marketed by African farmers in the Southern, Central and Eastern Provinces, in the proportion of 9 : 3 : 1. The trend of production on the line of rail during the past eleven years is shown in the following table:

MAIZE PRODUCTION FOR SALE IN THE RAILWAY BELT

(Thousands of bags of 200 lb.)

Year	*European grown*	*African grown*	*Total*
1947	190	54	244
1948	343	296	639
1949	283	61	344
1950	447	344	791
1951	399	290	689
1952	389	173	562
1953	602	435	1,037
1954	661	595	1,256
1955	615	320	935
1956	893	600	1,493
1957	1,176	832	2,008

10. The standard line-of-rail producer price was 40*s*. per bag delivered to Maize Control Board depots. African producers received 30*s*. per bag at rural buying depots, the 10*s*. difference being credited to the African Farming Improvement Fund, less the cost of transport and handling charges from rural buying depots. An account of the operations of this fund is given in paragraphs 37–40.

11. In the Eastern Province the surplus maize marketed through the Eastern Province Agricultural Produce Board showed a marked decline to 83,000 bags compared with 148,000 bags in the previous year. Of this 65,000 bags were sent through to the line of rail. The Eastern Province producer price remained at 19*s*. per bag, of which 2*s*. 6*d*. in the case of African-grown maize was credited to the Eastern Province African Farming Improvement Fund. The following table shows production, import and export figures for the Eastern Province over the past nine years:

MAIZE MARKETED IN THE EASTERN PROVINCE

(Bags 200 lb. net weight)

Year	*Local production*	*Imports*	*Total*	*Exports*
1949	30,500	22,500	53,000	Nil
1950	48,000	12,000	60,000	Nil
1951	80,000	Nil	80,000	37,700
1952	101,000	Nil	101,000	77,670
1953	129,100	Nil	129,100	107,764
1954	101,186	Nil	101,186	65,000
1955	133,809	Nil	133,809	100,000
1956	148,149	Nil	148,149	120,000
1957	83,496	Nil	83,496	65,000

12. There is no doubt that favourable maize prices have encouraged an expansion of acreage planted, and this, combined with higher yields per acre due to good seasons and improved fertiliser practice, has led to considerable over-production. It is estimated that after allowing for stocks on hand, and providing for a six month's reserve, some 700,000 bags will have to be exported at considerable financial loss. Grading will probably be introduced in Northern Rhodesia in the coming year, and a trial run on the basis of current grading regulations in Southern Rhodesia showed that the African crop at Monze would have been graded as 68 per cent. Grade A, 30 per cent. Grade B and 2 per cent. Reject. The main defect in Grade B was coloured grains, and excessive weevil damage in old crop maize was responsible for Reject. Propaganda has been carried out to warn farmers of likely developments, and this has resulted in a big demand for good Hickory King seed made available by the Maize Control Board: little difficulty is anticipated in raising the African crop to reasonable standards. Maize production for internal consumption is steadily expanding in all provinces: deficiencies in production are recorded in the Northern Province where some 12,000 bags had to be imported from Tanganyika.

Sorghums and Millets

13. Local surpluses of sorghums, finger millet (*eleusine coracana*) and bulrush millet (*pennisetum spp*) are marketed in the Western, North-Western, Northern and Eastern Provinces and Barotseland. These are essentially subsistence crops which do not enter into trade to any significant extent, although there is a steady demand by brewers for sorghum suitable for malting.

Rice

14. Interest in this crop continues on a reduced scale in Barotseland, the North-Western and Eastern Provinces. Its place is that of a useful supplementary food crop and not as a cash crop for export. Steady progress is being made with efforts to improve quality by the distribution of improved seed of the long-grained Faya type for wet areas and selected Angola Crystal. Trials with rice as a summer crop on the Kafue Flats have not proved encouraging to date and experiments are continuing.

Wheat

15. The position with regard to wheat is little changed from last year, namely that the Territory's requirements of some 20,000 tons per annum are met mainly by importation from Australia and elsewhere, local production being negligible. The hopes of producing a summer wheat, resistant to rust, appear now to be slight, and future hopes for locally produced wheat are likely to depend upon the winter irrigated crop. The first harvest upon the Rhodesian Selection Trust's pilot polder on the Kafue Flats yielded an average of 5.67 bags of 200 lb. net weight per acre from eighty-eight acres.

Groundnuts

16. Groundnuts provide a valuable subsistence crop in all parts of the Territory, and they have become commercially important in the Eastern Province and in the Balovale and Kabompo districts of the North-Western Province. A small surplus is also produced in the Kalomo, Namwala and Choma districts of the Southern Province. The guaranteed price continued at £45 10*s*. per ton delivered to the line of rail. Marketed surpluses totalled some 71,000 bags of unshelled nuts (net weight 180 lb.) of which 65,000 bags came from the Eastern Province and 6,000 bags from the North-Western Province. It is estimated that a further 10 per cent. of the crop was sold across the borders of Nyasaland and Angola. The trend of production in the Eastern Province is shown in the following table:

EASTERN PROVINCE GROUNDNUT PRODUCTION (IN BAGS OF 180 LB.)

1951–1957

Season	*Fort Jameson*	*Katete*	*Petauke*	*Lundazi*	*Total*
1951–52 ...	900	900	1,200	1,250	4,250
1952–53 ...	6,000	7,500	12,000	890	26,390
1953–54 ...	22,122	10,350	26,350	355	59,177
1954–55 ...	11,789	24,523	15,937	915	53,164
1955–56 ...	15,828	22,966	22,437	5,400	66,631
1956–57 ...	17,791	25,004	18,721	3,000	64,516

Local demands for oil expression and ration purposes, totalling some 21,000 bags, were fully met, and the balance was exported successfully from the Eastern Province through the port of Beira. Great care was taken to maintain the high quality of the nuts for export, which are of confectionery quality commanding a premium on overseas markets. From every point of view groundnuts are a desirable crop to grow and every encouragement is being given to their production.

Pulses

17. Cowpeas and various strains of phaseolus beans of haricot and sugar type are grown for subsistence purposes in most parts of the Territory. Yields are generally low and uncertain and only small quantities are marketed. Agronomists are working on leguminous crops but so far without outstanding success. Some progress is being made with the introduction of soya beans, for which there would appear to be a satisfactory market, but production is still mainly exploratory.

Cassava

18. Cassava is an important staple food crop in the higher rainfall parts of the Territory in the Northern and North-Western Provinces and on the Kalahari sands in Barotseland. Locally it is a cash crop and there is a regular export of cassava meal down the Zambezi from Balovale to Barotseland. Mosaic disease appears to be on the increase and is regarded as a serious factor limiting yield. Work on resistant strains and varieties is being undertaken at the department's central research station at Mount Makulu, near Lusaka.

Vegetables and Fruit

19. Increasing quantities of vegetables and fruit are being produced round centres of population such as Lusaka, Fort Jameson, Fort Rosebery and the Copperbelt towns. There is considerable room for improvement in methods of production and marketing and for the supply of improved planting material. Increased attention is being given to this. A small co-operative irrigation scheme was started successfully with thirty growers drawing water from the dam at Chipapa near Lusaka. A successful scheme has also been introduced to a peasant farming group near Luwingu: in other parts of the country attention is being paid to this important subject.

Cotton

20. Low yields in 1956 and poor financial returns reduced production of cotton in the Luangwa Valley of the Eastern Province to negligible proportions. The number of growers declined from 580 to ninety-three and production of seed cotton fell from 34,000 lb. to 8,000 lb. Attention seems to be shifting away from cotton as a cash crop in the valley to rice and groundnuts.

Tobacco

(*a*) *Burley*

21. It is encouraging to be able to record a distinct improvement in African Burley tobacco production in the Eastern Province. Over the Limbe floors, 12,154 lb. were sold for an average price of 34.87 pence per lb. against 6,890 lb. in 1956 selling for an average price of 18.29 pence per lb. There is unquestionably an important place for Burley tobacco as a cash crop on the red loam soils, but it is likely to be some time before production can be raised to the 1950 level of over a quarter of a million pounds.

(*b*) *Turkish*

22. Good progress has been made with the expansion of Turkish tobacco growing which is a new crop for African peasants, well suited to their circumstances. Production amounted to 17,000 lb. realising an average price of 34.25 pence per lb. against 12,000 lb. fetching 29.5 pence per lb. in 1956. Production is still largely exploratory at this stage in the Southern, Eastern, Central and North-Western Provinces. Prospects appear to be good for further expansion in 1958.

Coffee

23. Attention continues to be given to the development of coffee-growing in the Ikumbi area of Isoka district in the Northern Province. Production and planting are expanding and the prospects appear to be favourable for the development of a small scale industry. Contact has been maintained with the Tanganyika Department of Agriculture, and valuable help has been received from the officers stationed at Mbozi. To date the Isoka Native Authority has been strongly opposed to the introduction of any legislation for the control of the coffee industry.

PART II.—WORK OF THE DEPARTMENT

POLICY

24. The policy of the department is to develop and to stabilise African agriculture in order to ensure self-sufficiency in food requirements combined with as high and stable a level of rural prosperity as possible. To give effect to this policy the department is organised to carry out investigations, planning and advisory work on the following lines:

(i) Stabilisation of population on the better areas of soil through planned development and the introduction of permanent farming systems.

(ii) Protection of natural resources by land use planning particularly on watersheds, by bush fire control, contour farming, rotation of crops, attention to soil fertility, replacement of sledges by carts, development of water supplies and controlled grazing.

(iii) Improvement of rural living standards by the encouragement of such cash and food crops as groundnuts, rice, fruit, vegetables, Turkish tobacco, Burley tobacco and soya beans.

(iv) The provision of development capital by way of loan schemes and subsidy rewards for good farming practices.

Board of African Agriculture

25. The Board of African Agriculture met twice during the year, under the chairmanship of the Director of Agriculture, to discuss matters of policy and to advise the Member for Agriculture and Natural Resources. The board reviewed the progress of peasant and improved farming schemes, the conservation programme, including bush fire control in African areas, human nutrition and the integration of marketing, animal husbandry and crop production.

Federal Standing Committee on Agricultural Production

26. The Director and the Chief Research Officer represented Northern Rhodesia on this federal committee, which gave its attention during the year to a stocktaking of agricultural resources on a federal basis, leading to the compilation of a comprehensive federal agricultural

policy. In its task the committee received the assistance of Sir Frank Engledow, until recently Professor of Agriculture at Cambridge University. The report of the committee upon the future agricultural policy of the Federation was almost complete by the close of the year.

Federal Agricultural Research Advisory Committee

27. The Chief Research Officer represented the department on this federal co-ordinating committee, which has kept under review research programmes for the four departments concerned.

ORGANISATION

28. The Department of Agriculture is organised as follows:

(i) Headquarters in Lusaka for administration, accounting and advisory staff for economics, tobacco production and irrigation.

(ii) Provincial and district advisory staff which provides a thin but reasonably comprehensive cover throughout the Territory, and constitutes by far the largest division of the department.

(iii) Research and specialist services based on the Central Agricultural Research Station at Mount Makulu, nine miles south of Lusaka, consisting of six sections for—

(*a*) soil survey and land use, including soil conservation;

(*b*) grasslands and pasture research;

(*c*) agronomy and farm management;

(*d*) plant breeding;

(*e*) plant pathology;

(*f*) agricultural chemistry.

Staff

29. The staff position improved immeasurably during the year. All vacancies for Agricultural Officers on the normal establishment were filled, although six out of the establishment of thirty-three are still undergoing training and therefore not immediately available. The services of an agricultural economist have been greatly missed during the year and it is hoped that the vacancy will soon be filled. Two vacancies for Chief Agricultural Officers have been created by the retirement on pension of Mr. C. J. M. Krige, and the promotion of Mr. C. E. Johnson first to the post of Assistant Director, and then to Deputy Director.

30. Mr. M. Halcrow, O.B.E., Deputy Director, was promoted to the appointment of Development Commissioner, Northern Province, with effect from 1st July, 1957.

31. The Principal Agricultural Supervisor and the Supervisor establishments were complete during the year.

Appendix I to this report shows the staff situation at the close of the year, and Appendix II the staff list.

EXTENSION SERVICES

32. For extension purposes the department is organised upon a provincial and district basis corresponding with the administrative subdivisions of the Territory. Responsibility is decentralised from headquarters to seven Provincial Agricultural Officers. District work is carried out by fourteen Agricultural Officers and fifty-five Principal Agricultural Supervisors and Agricultural Supervisors, assisted by 264 African Agricultural Assistants and 254 African Agricultural Capitaos. The African staff is distributed throughout the countryside in close contact with the people: the provision of housing for this field staff has continued to be a major operation.

33. Extension work is carried out from thirty-eight agricultural centres distributed as follows:

Southern Province	8	Mapangazia, Magoye, Monze, Kanchomba, Mapanza, Kalomo, Mochipapa and Gwembe.
Central Province	10	Broken Hill, Mumbwa, Keembe, Muchenje, Muswishi, Serenje, Mkushi, Mukulaikwa, Chalimbana and Shibuyunji.
Eastern Province	6	Fort Jameson, Chadiza, Kalichero, Lundazi, Petauke and Katete.
Northern Province	5	Kasama, Lunzuwa, Isoka, Luwingu and Chinsali.
Luapula Province	2	Fort Rosebery and Kawambwa.
Western Province	1	Ndola rural district.
North-Western Province	4	Solwezi, Kasempa, Kabompo and Balovale.
Barotseland	2	Namushakende and Mankoya.

34. Plans were in hand at the close of the year to open an agricultural station at Sesheke in Barotseland. It has also been decided to develop an agricultural station to serve Ndola rural district on the Masaiti site south of Luanshya and near the Kafulafuta River.

Approach to Extension

35. Village touring, individual farm visits, demonstration farms, organised field days and agricultural shows continue to be the most widely used techniques in the field. Weekly radio broadcasts from the Lusaka station have also been arranged and periodical articles are sent to the Press. Extension programmes have to a large extent centred round the promotion of betterment schemes and soil and water conservation.

African Farming Betterment Schemes

36. The three schemes, designed to provide capital for African farmers prepared to accept direction, have been continued successfully during the year, they are:

(i) The African Farming Improvement Scheme, which operates in the scheduled areas of the Maize Control Board in the Southern and Central Provinces;

(ii) The African Farming Improvement Scheme in the Eastern Province;

(iii) The Peasant Farming Scheme, which applies to all provinces.

The first two schemes are financed by funds derived from levies on maize marketed through the Maize Control Board and the Eastern Province Agricultural Produce Board respectively. The third is financed from a revolving fund of some £260,000 provided by a Colonial Development and Welfare loan. Details of the operation of these funds are summarised below.

(i) African Farming Improvement Schemes, Southern and Central Provinces

37. This scheme is financed from the difference between the standard price of maize, 40*s*. per bag, and 30*s*. per bag paid to the African farmer at rural buying depots after meeting transport and handling charges. The scheme provides for bonuses to registered improved farmers, subsidies on the purchase of carts and fertilisers, loans for the purchase of implements and for conservation works. Progress can be recorded with all parts of the scheme but it is won only at the cost of considerable time and effort by the field staff.

38. The administering committee met three times during the year. Financial control was under the guidance of the auditors, Messrs. Deloitte, Plender, Griffiths and Annan, whose assistance has at all times been invaluable. The statement of income and expenditure for the year ended 31st May, 1957, showed that the income of the fund in respect of that year was £216,159 by comparison with £137,673 in the previous year due to a bigger crop. Expenditure showed a marked upward trend as can be seen from the following comparative table:

	1954–55	1955–56	1956–57
	£	£	£
Bonuses to improved farmers	27,716	34,987	36,307
Subsidies on carts, fertilisers, seeds, etc. ...	29,102	20,625	40,936
Soil and water conservation works ...	28,391	27,616	22,787
Grants to native authorities	1,360	4,950	1,528
Administrative expenses	728	1,270	2,415
Irrecoverable loans	106	68	—
	£87,403	£89,516	£103,973

The sum of £125,547 representing excess of income over expenditure was carried forward for investment. In accordance with the wishes of the committee, dams and weirs to a total value of £100,132 were handed over to the native authorities concerned and taken out of the books of the fund. The value of fixed assets is shown in the balance sheet to be £104,990, investments £194,000 and current assets £464,570.

39. The following is a brief summary of the activities in 1957 under the main headings:

(*a*) *Registered Improved Farmers*

Farmers achieving a satisfactory standard including approved crop rotation and manuring received bonus at the rate of 27*s*. 6*d*. per acre for Grade 1 farmers, 18*s*. per acre for Grade 2, and in the Central Province 9*s*. per acre for a Preliminary Grade 3.

In the Southern Province, £24,361 was paid in respect of 19,128 acres to 1,135 improved farmers. (Corresponding figures for last year were £22,158 to 1,077 farmers for 18,769 acres.)

In the Central Province £11,947 was paid to 433 farmers in respect of 12,988 acres. (The corresponding figures for last year were £12,829 paid to 371 farmers for 10,125 acres.) The classification has been considerably tightened up during the year. The proportion of farmers in the various grades for the two provinces combined were 66 per cent. Grade 1, 25 per cent. Grade 2 and 9 per cent. Grade 3.

It will be apparent from the above figures that whilst steady progress is being made with this scheme there is certainly no snowballing effect. It is calculated that some 5.8 per cent. of the adult male population in the Southern Province are registered as improved farmers, but many more benefit from the demonstration of good farming standards. The main shortcomings of the scheme appear to be:

(i) The cost of administration.

(ii) Farmers tend to join and leave the scheme with undue frequency in order to cash in on the built-up fertility.

(iii) The approved rotation of crops is not entirely satisfactory, the proportion of legumes being too high: this leads to improved farming methods being followed on only a proportion of the land.

(iv) Although the title of the scheme suggests a balanced approach, in fact it applies only to the arable land, grazing land is neglected. There is a great need for an integrated scheme which will draw animal and crop husbandry closer together. Looking into the future it is hoped that research will provide satisfactory answers to the problems of rotation, and that land use planning will lead to a better balance between crop and animal husbandry.

(*b*) *Subsidies on carts, fertilisers, seeds, etc.*

A record total of 1,518 carts was distributed in the two provinces during the year. Each cart received a subsidy of £20 from the fund. Superphosphate totalling 410 tons was supplied through the scheme, and 403 tons of sulphate of ammonia. Seeds were distributed to improved farmers at cost as follows:

	Southern Province (bags)	*Central Province (bags)*
Groundnuts	60	2
Cowpeas	25	3
Velvet beans	142	10
Sunnhemp	65	350
Maize seed	450	15

(*c*) *Conservation Works*

Soil and water conservation works have continued to be financed very considerably from the fund. In the Southern Province, works to the value of £15,000 were constructed: and in the Central Province, £5,570.

(ii) African Farming Improvement Scheme, Eastern Province

40. The Eastern Province African Farming Fund arises from a levy of 2*s*. 6*d*. per bag on African maize marketed in the province. The fund is administered by a sub-committee of the provincial team under the chairmanship of the Provincial Commissioner. A sum of £5,237 was disbursed as good farming bonus to individual farmers, and £763 as improved village bonus; £10,662 was spent on subsidies on scotch carts, £1,103 on other subsidies, £496 for minor conservation works and £100 contribution to the cost of Katete Show, a total expenditure of £18,334.

(iii) Peasant Farming Scheme

41. As explained in previous reports, the Peasant Farming Scheme provides capital on medium term loans for the establishment of small scale commercial farmers prepared to accept guidance in such matters as limitation of acreage, crop rotation, manuring methods and so on. Farmers are required to sign an agreement with the native authority with regard to the repayment of loans in return for which security of title to the holding is guaranteed subject to the observance of good husbandry.

Funds are provided from a Colonial Development and Welfare loan under the control of the Commissioner for Rural Development who is guided by provincial teams and the Director of Agriculture.

The scope of the scheme is Territory-wide, but in practice it has been applied particularly in areas away from the line of rail which do not receive assistance from the African Farming Improvement Scheme.

Eastern Province

42. Here the Peasant Farming Scheme has been most successful: soil and water conditions are favourable and orderly marketing has been secured by the Eastern Province Agricultural Produce Board. Originally the benefits were available only to group settlements, but three years ago the scope was extended to individual farmers and now a promising start has been made to develop a more comprehensive approach through planned improved villages. The following table shows progress over the last seven years:

PEASANT FARMS IN EASTERN PROVINCE

		Petauke	*Katete*	*Kalichero*	*Ngoni Areas*	*Chadiza*	*Lundazi*	*Total*
1950–51	B	—	26	—	—	—	—	26
	I	—	—	—	—	—	—	—
1951–52	B	—	26	—	8	—	—	34
	I	—	—	—	—	—	—	—
1952–53	B	16	39	10	10	—	—	75
	I	6	4	—	—	—	—	10
1953–54	B	33	60	13	10	—	—	116
	I	30	15	3	2	—	—	50
1954–55	B	35	82	20	10	—	—	147
	I	47	28	15	5	7	—	102
1955–56	B	69	102	36	16	—	—	223
	I	61	63	19	33	19	—	195
1956–57	B	110	117	54	16	6	13	316
	I	223	63	43	125	115	22	591
1957–58	B	118	125	61	38	11	31	384
	I	312	174	71	222	75	69	923

(*Note.*—B=Block Farms; I=Individual Farms)

The incomes received by peasant farmers in the Eastern Province have varied considerably from around £20 per annum, for newly established farmers, up to £86. The repayment of loans has been satisfactory.

Central Province

43. The Peasant Farming Scheme continues to hold its own in the Central Province and it is expanding steadily where conditions are favourable. On the whole loan repayments have been satisfactory. Only in Serenje district has the scheme run into major difficulties where poor soils cannot support continuous farming. A further 60 per cent. of stumping loans has been written off for the Musola Group, but it is encouraging to record that the Mulembo farmers have almost paid off their loans. Peasant groups in Mumbwa and Keembe showed some progress. Successful boreholes sunk at Keembe and Mukulaikwa have proved of very great value to the farmers around. At Muswishi the farm settlement established as part of the tsetse barrier is being successfully developed on peasant farming lines with Turkish tobacco as the cash crop. The following table shows the growth of the peasant farm movement in the Central Province, district by district, over the course of the last three years:

PEASANT FARMS IN THE CENTRAL PROVINCE

	1955–56	1956–57	1957–58
Serenje	50	48	47
Mkushi	35	44	45
Muswishi	10	10	10
Keembe	12	23	23
Mumbwa	14	14	34
Mukulaikwa	—	1	6
	121	140	165

Western Province

44. The settlement of Southern Rhodesia Africans at Nyenyeshi, forty miles south of Ndola, has experienced a variable year. Farmers on better soils are holding their own, whilst others on poor soils, mainly on the south side of the river, or those with little interest in farming, are likely to go out of business at an early date. Generally speaking the animal husbandry side of the settlement is weak and soil fertility has been neglected. Some individuals have done well with vegetables grown with seepage waters in the dambos. The average income from all sources was £110, of which approximately one-third was derived from vegetable production, the balance coming from the farm or other enterprise. Some loan repayments have been made during the year, but on the whole the position cannot be considered satisfactory.

Eight new peasant farms have been demarcated on good soil at Mpongwe in the heart of the Ndola rural district. Three farmers took up occupation before the end of the year. An enterprising individual poultry farmer at Mteteshi, near Ndola, has enjoyed a successful year, although no repayment of his loan has been possible. Day-old chicks, numbering 1,050, were purchased, the pullets being raised for egg production and the cockerels being disposed of as table birds. This kind of development would appear to be directly in line with the needs of the Copperbelt markets, and valuable experience is being gained, both by the farmer and by the staff of the department.

Northern Province

45. This has been a year of stocktaking in the Northern Province as it becomes increasingly evident that the system of farming developed successfully in the Eastern Province and elsewhere does not fit the conditions in this province. Out of a total of 227 farms demarcated, 179 were occupied in the 1957–58 season, located at sixteen centres in the Abercorn, Isoka, Kasama, Kawambwa, Mpika, Chinsali and Luwingu districts.

A number of so-called individual farmers have been established as distinct from group settlements, and this may well prove to be more satisfactory under the extensive conditions obtaining in the province. Farm incomes have varied from 30*s.* per acre at Ngulula near Kasama, to £10 per acre from vegetable production at Lufubu in Luwingu district.

The policy for the future will be one of consolidation rather than extension. In the meantime a programme of experimentation is being conducted in order to find more satisfactory farming systems suited to local conditions.

Barotseland

46. There is still considerable uncertainty as to the place of peasant farming under Barotseland conditions. Two out of eleven farmers established in the Lukalanya group were dispossessed during the year for such malpractices as the selling of livestock issued on loan, and for non-cultivation of the holding. The remainder of the farmers had difficulty in competing with the handwork involved in drainage and weeding. Absenteeism is common and animal husbandry neglected. In fact peasant farming is not working. The main difficulty here seems to be similar to that in the Northern Province, namely that enthusiasm for extension has gone ahead of experimentation. Two newly established farmers at Kataba, near the Agricultural Headquarters at Namushakende, experienced a fairly good season, but it is feared that now their loan funds have been exhausted they are likely to suffer in the same way as the Lukalanya peasants.

47. The development of peasant farming will be kept under close review in the future and no expansion is at present contemplated.

Agriculture in Schools

48. In all provinces the field staff of the department co-operate with school authorities in the layout and management of school farms and gardens with varying success. The main factors contributing to success are the interest of the teachers concerned, and the general environmental circumstances of the schools. The third Teachers' Course in Agriculture was held during the year at Monze Agricultural Training Centre, attended by twenty-two teachers. It is gratifying to receive clear indications from the provinces of the value of these courses.

Agricultural Education

49. The department maintains two agricultural training centres, one at Monze serving the southern parts of the Territory, the other at Lunzuwa near Abercorn serving the northern areas. Both schools had a satisfactory year, although difficulty is still being experienced in attracting pupils with higher basic schooling than Standard VI. The calibre of students of this standard is no longer satisfactory and students are much younger than they used to be. Every endeavour will be made to recruit students with at least Standard VIII in the future.

50. At Monze the seventh course for Agricultural Assistants was completed in June and twenty-five students received their certificates and were appointed on probation as African Agricultural Assistants in the department. The eighth assistants' course entered its second year having been reduced from thirty-three to twenty-two by wastage. In August a teachers' course was commenced instead of the ninth assistants' course. At Lunzuwa fourteen students out of a class of nineteen in the seventh course for Agricultural Assistants received certificates and were appointed to the department. Twenty-six students entered the second year in the eighth course, two having failed to pass the first year examination. Thirty-four students entered the ninth course in November, 1957.

During the year an Agricultural Officer transferred to the department from Southern Rhodesia with teaching experience and he has taken up duties as the Agricultural Education Officer.

51. The future of the two training schools has been under a critical review during the year as the strength of the African Agricultural Assistants approaches full establishment. There are strong arguments in favour of concentrating teaching at one centre, and Monze is considered to be more suitable for this purpose. An added factor emphasising the need for change is the probable opening of a federal farm institute for African agricultural teaching at a post-Cambridge sub-university level in the near future. Refresher courses have been held for African field staff during the year in most provincies.

CONSERVATION WORK

52. The agricultural field staff carries out conservation work as a normal part of its duties, assisted by a Conservation Officer and land use planning staff based on the Research Station, Mount Makulu.

The department is represented on the Natural Resources Board by the Director of Agriculture. The board has held regular monthly meetings during the past year, and an increasing amount of time has been devoted to the consideration of soil and water conservation in African areas. The conservation position in each province is reflected in the following extracts from Provincial Agricultural Officers' reports:

Southern Province

53. "In the Choma and Mazabuka districts soil conservation work occupied a large proportion of the time of the staff. In these districts all anti-erosion measures are constructed by the department financed by the African Farming Improvement Fund. The cultivator is responsible only for the maintenance of construction works. This arrangement places a heavy burden on the shoulders of the department and means in fact that the department has accepted responsibilities which are normally, and indeed should be, those of the cultivator. The result of this is that conservation work is done partly at the expense of time which should be spent on extension work and both extension work and the amount of conservation work done must suffer.

All stations are equipped with mechanical units of light machinery. A substantial amount of work was completed during the year, but there is still a vast amount to do, and the completion of routine contour ridging alone is nowhere near in sight. The following works were completed during the year:

Conservation Works Completed in the Southern Province, 1957

Old contours reconstructed ...	57 miles.
Level contours built	274.65 miles.
Graded contours built	79.4 miles.
Storm drains—miles	9.45 miles.
Grass strips marked	139.2 miles.
Cultivation boundaries marked ...	197.55 miles.
Weirs partly built	2
Weirs completed	3
Dams built	1
Dam spillways repaired	6
Dams fenced	7
Gullies controlled	2 miles.
Drystone gully bolsters	13,641
Road repair work	68.75 miles.
Wells sunk	4
Wells lined	10
Drifts constructed	11

The light machinery available is unable to work on earthwork construction efficiently in the heavy compacted soils of the plateau during the dry season when the fields are free of crops and this restricts its output substantially. Slightly heavier units with better machinery are being introduced and may help solve this problem. The scarcity of hand labour also curtails output and hand labour will always be required to finish off the work of the light machinery.

The Plateau Tonga are not appreciative of all that is being done for them and they do not welcome anti-erosion measures being constructed in their fields. Although the department has right of entry for conservation purposes, it is only where cultivators consent and co-operate that anti-erosion work can go ahead. Under these circumstances where the approach is piecemeal, it is difficult to plan works soundly and, for example, level contours often have to be constructed where graded contours are necessary but cannot be put in because of the objections of individuals. During 1957 little active opposition was encountered—a welcome improvement on previous years—and occasionally requests from individuals for assistance in combating erosion were received.

A serious erosion and misuse of land problem has arisen on the escarpment of the Zambezi Valley in which fairly extensive and ever-increasing cultivations are taking place. Most of these cultivations are on excessively steep slopes which are not suited for cultivation and active and severe erosion rapidly ensues.

Land Use Planning

Two pilot land usage projects are in being in the province and are being continuously developed and improved into model land use demonstrations to show the benefits which accrue from land planning and land usage. Improvements are introduced at opportune moments as local conditions permit and as fast as the inhabitants can absorb them.

The Upper Kaleya Scheme, covering 14,000 acres, is situated on the headwaters of the Kaleya River in the Mapangazia area. The grazing land was fenced off from the arable land and subdivided into paddocks. The grazing land was originally badly depleted and eroded by cultivation and overgrazing but the protection afforded by one season's control by fencing has resulted in a fair re-establishment of ground cover and at the beginning of the year it was decided to reopen the paddocks for light grazing. Three hundred head of cattle were grazed in the paddocks during the day and returned to the kraals at night. This resulted in some inconvenience and eroding cattle tracks, and the people later agreed to leave their cattle in the paddocks permanently. The grazing area was successfully protected against fire."

Central Province

54. " There were ten Ferguson tractors with mid-mounted terracers, the property of the African Farming Improvement Fund, operating in the Maize Control Board area during the year. These tractors were mainly engaged in soil and water conservation. A considerable amount of new contour-ridging was carried out during the year in addition to the maintenance of existing ridges.

The contour-ridging constructed during the year was as follows:

(*a*) Soli Reserve—120,000 yards, of which 15,000 yards were on non-improved farms.

(*b*) Mumbwa—15,840 yards of contour and 35,800 yards of dambo and stream bank lines.

(*c*) Sala—16,346 yards of new ridges and 12,927 yards rebuilt.

(*d*) Muchenje—34,000 yards constructed.

The Agricultural Officer, Chalimbana, tried to persuade the Soli Native Authority to pass regulations to control soil and water conservation, but these were not accepted in their original form and as modified their effectiveness was considerably reduced.

An investigation of alleged stream bank cultivation on the Mkushi River was carried out on behalf of the Natural Resources Board; the situation was found to be less serious than expected. Control of cultivation is needed in the area to protect springs and sponges. In the Serenje district contours have been pegged on eight individual farms; the ridges were built by the farmers themselves.

For water conservation the department has built a small dam measuring seventy yards long by fifteen feet high at the Matabele Settlement and a ' T ' dam at Makusa, near Keembe Agricultural Station. Also in Keembe area the native authority completed the Kalola dam and commenced operations on the Kakoma dam.

Throughout the province agricultural staff assisted in the enforcement of native authority conservation regulations."

Northern Province

55. " The Northern Province as a whole, although a watershed area, has few erosion problems at present. The increase in population, however, and the continued introduction of cattle will pose problems which will have to be constantly watched.

Certain specific watershed areas within the province, such as the Luangwa, demand attention at once and a very useful survey was carried out in this area in July.

Soil conservation measures are, as always in a subsistence area, unpopular. There are too many laws on the books which the native authorities are unwilling to apply. It is felt that there is a need for a revision of native authority orders with three or four natural resources orders applicable to the whole province. There is a tendency to regard soil conservation as one more example of the department's negative approach to agriculture. The answer is to teach conservation as part of farming with less emphasis on the construction of earthworks. Contour furrows may be more effective than banks under heavy rains. The early burning policy was again ineffectual in 1957 for the same reasons as stated in the last annual report, namely:

(i) Late and heavy rains.

(ii) Lack of interest and action by native authorities.

Some readjustment of thinking is necessary on early burning. It is undoubtedly the correct and proper treatment in forest and hence ' chitemene ' areas, but the time is coming when the virtue of a controlled late burning policy in specified cattle areas will have to be considered.

Furrow construction and maintenance is becoming an important facet of district work. This is a great development in an area where the abundance of water may partly compensate for the lack of soils."

North-Western Province

56. " Soil conservation measures have taken the form of control within Government townships, the encouragement of early burning, and the maintenance of contour ridges in the Chizera/Kabompo River areas by the cultivators concerned. Generally throughout the province there is little danger from soil erosion under dry land cultivation at the present stage of agricultural development, except in a few areas of steep slopes along the Kabompo and Mutanda Rivers. There are, however, important sponge areas feeding the Kafue and Zambezi headwaters which require careful preservation. As already remarked stream bed and dambo cultivation are on the increase, and the promulgation of native authority orders relating to such cultivation is now becoming necessary. There is also a certain amount of sheet erosion taking place round human habitations

which will require attention in the future. Control of cultivation within townships is receiving attention: at Kasempa cultivation within the township has been confined to seventy half-acre plots with five larger plots occupied by more progressive Government employees, while at Solwezi and Balovale surveys of the existing cultivation are in progress with a view to controlling excessive cultivation.

Early burning was reasonably well done throughout the province: however a considerable number of late fires were started along roadsides, and by fire escaping from ' chitemene ' gardens into unburnt bush. In most districts the exercise was a combined one including native authorities as well as the Forest Department."

Eastern Province

57. "The policy of level contour bunding and ridge cropping continued to be implemented in all cultivated lands and new gardens. Satisfactory progress is on record in the difficult Ngoni areas where basic soil conservation measures are being gradually accepted in most chieftaincies. The combined efforts of the Provincial Administration and of the department have resulted in satisfactory progress being achieved in a difficult year. Vigilance is still required, as opposition to soil conservation measures in Ngoniland is political, and strong measures are required in the interest of the people themselves. In other areas soil conservation measures are fully accepted and the way is now open to land use planning.

The following table shows the extent of soil conservation works undertaken during the year:

Soil Conservation Works, 1957

Area	*Contour Ridges pegged* 1957 (*yards*)	*Storm Drains constructed* 1957 (*yards*)	*Number of Villages practising Contour Cultivation*
Petauke ...	750,000	Nil	850
Katete ...	423,000	Nil	462
Chadiza ...	396,000	Nil	528
Ngoni Areas ...	500,000	300	595
Kalichero ...	362,302	1,500	248
Lundazi ...	704,000	Nil	780

In addition, work continued on the construction of over 4,000 stone and brushwood check weirs in the gullied areas of Ngoniland, Kalichero and Chadiza. In the South Ngoni areas, a number of brushwood check weirs were deliberately burnt coinciding with the time when political agitation reached its peak in the province. It is interesting to note that local native authorities are quite prepared to finance to a certain extent soil conservation works in their areas."

Barotseland

58. Erosion is negligible in the plateau parts of the Protectorate where the population is sparse and the soils of Kalahari sand are extremely porous. Drainage of the fertile " sishanjo " soils on the margins of the flood plains by the construction of canals is work of great importance in making land suitable for crop production. Land use demonstration plots have been established at a number of centres emphasising particularly the value of Napier fodder as a rotation crop.

INVESTIGATIONAL WORK

59. Under this heading will be briefly reported the results of special surveys and investigations and the work of the specialist services carried out during the year. It should be emphasised that this work is carried out entirely in support of the extension services in the field, that is it is essentially applied and not basic research.

Central Agricultural Research Station, Mount Makulu

60. The establishment of the Central Agricultural Research Station at Mount Makulu, nine miles south of Lusaka, was virtually completed during the year according to plan. The staff also was almost up to full strength at the close of the year. The specialist services now available at Mount Makulu are beginning to make their contribution towards the work of the department, and the field staff, so long starved of such facilities, are now coming to make full use of it. Only an outline of the research work will be given in this report: it is hoped to publish separately a more detailed account.

Soil Surveys

61. This has been a busy year for the Soil Survey Section under the leadership of Dr. Ballantyne. In addition to the fundamental part played by his section in the land use investigations described below, the soils of most of our agricultural stations, including Mount Makulu, have been investigated in detail, and a good start has been made towards the compilation of a soils map of the Territory. Special attention has been given to a study of the soils of the Kafue Flats in connection with the experiments at the Kafue pilot polder and at Chiansi.

Conservation Surveys

62. A review of the effectiveness of past conservation work in the Southern Province was initiated by the Conservation Officer towards the end of the year to provide a guide for the future.

Land Use Planning

63. Land use investigations and planning have received attention from both specialist and district staff: the following are the more important projects of this nature carried out during the year:

Southern Province

Gwembe Resettlement

64. The survey of carrying capacities of vacant land in the valley was completed during the year. Valley soils were classified into three groups and carrying capacity was assessed by studies of current land usage. It is clear that a proportion of the population must be rehabilitated out of the valley or on a non-agricultural basis. Adequate land has been found for only 21,000 people out of a population of 29,000 which will be affected. This makes no provision for population increases. It is believed, however, that numbers of people in the Gwembe district will become fishermen rather than subsistence crop producers and will buy their grain foods or exchange fish for them. This would relieve pressure on the land. Such resettlement as has already taken place has proceeded smoothly and the situation generally appears to be well in hand.

Plateau Tonga Land Use Survey

65. A major land use investigation covering 53,000 acres in the maize and cattle areas near Monze in the Southern Province had to be abandoned as a result of local opposition to the survey teams brought about by political agitators. This was particularly disappointing in an area in which the department was well known and had been operating for many years. The object was to collect field data as a basis for regional land use planning in an endeavour to obtain a better balance between arable and grassland. Detailed agricultural and demographic data were obtained from approximately 4,000 acres of the survey area, and this information is being projected as far as possible by the use of aerial photographs. The main objective cannot be abandoned: force of circumstances will, however, delay progress.

Barotseland

66. Attention is being given to experiments and demonstration of optimum land usage on the edges of the flood plain in Barotseland, which are likely to be of great value and significance in the future.

Eastern Province

Soil Surveys in Katete-Petauke Districts

67. Some 600 square miles in the Lupande/Nyamadzi triangle in the north of Katete district, and in the Nsenga area south of Petauke were surveyed during the year, and soil maps and reports are in course of preparation. Soil investigations were also made in the Lundazi and Fort Jameson districts to provide material for the territorial soils map.

Angoni Rehabilitation and Chipangale Resettlement

68. Good progress is reported from the Fort Jameson district with the rehabilitation and resettlement work following the recommendations made by Messrs. Priestley and Greening in their report on the area published last year. Two hundred and fifty square miles in the Chipangale area were regionally planned for resettlement, roads were constructed and four dams and thirty wells were established by the Department of Water Development and Irrigation. The first settlers enjoyed a successful year.

Northern Province

69. Preliminary work on soil classification has started in the Northern Province initiated by the Soil Surveyor and conducted by the field staff. A simple classification of soils into eight types based on physical and visual criteria is being followed to indicate areas justifying more intensive investigation. Reconnaissance in the country round Kasama was carried out in order to locate a suitable site for rural development. A site was found north-west of Kasama which it is thought will meet requirements.

Western Province

70. The staff in Ndola rural district spent most of the year carrying out soil classification surveys on twelve square miles in the Masaiti area where proposals are under discussion to establish a new rural boma and agricultural station, and on 100 square miles in Nkanga-north which lies to the west of the Kafulafuta River. Soils in this area were on the whole disappointing and the survey confirmed the choice of the site at Masaiti.

71. A soil survey reconnaissance was also carried out over 260 square miles of country in the Nkanga/Lampuma/Mukutuma area which is still being mapped. These surveys provide valuable basic information for the sound development of the Ndola rural district.

North-Western Province

72. An agricultural survey of the Balovale and Kabompo districts was completed during the year. Three ecological regions were recognised: (1) the riparian plains west of the Zambezi, (2) the Kabompo River region, and (3) the Chavuma region. The preparation of a report on this survey is in hand.

73. Further work was carried out during the year in the Kafue headwater area, north-east of Solwezi by a team of which the Agricultural Supervisor was a member. Recommendations were made for some re-distribution of population within an area surveyed of some 700 square miles, and recommendations were also made for the declaration of protected forest areas.

74. Agricultural reconnaissances were carried out in an area of sixty square miles adjacent to the Kasempa–Mankoya Road and over thirteen and a half square miles in the Kasempa township.

Irrigation Investigations

75. The main centres of interest have been on the Kafue Flats where the departmental experiment station of fifty acres is located at Chiansi on the north bank of the river, and the pilot polder of the Rhodesian Selection Trust, 600 acres in area, located in the Mazabuka district on the south bank. Summer crops were disappointing at Chiansi, and only jute and some fodder crops showed promise. Rice, which it was thought would have proved the main summer crop, was unhealthy and yielded badly. Wheat under irrigation during the winter showed promise but unfortunately wind interference with water distribution by the overhead sprinkler system was so uneven as to mask the results of the critical variety and fertiliser trials laid down. Steps have been taken to correct this in the future. Close contact was maintained with the Rhodesian Selection Trust pilot polder through an advisory panel on which the Department of Agriculture is represented by the Director and the Chief Research Officer. The Chief Research Officer has been closely associated with the formulation of a comprehensive series of trials. High floods on the Kafue and a host of soil and other problems combined to make the year a full and anxious one for all concerned. There are good grounds for optimism but clearly much careful research will be necessary before satisfactory farming systems can be evolved suited to the special conditions obtaining on the flats.

76. The Senior Agricultural Officer (Irrigation) advised the field staff of the department on irrigation projects and problems throughout the Territory.

The co-operative enterprise of thirty vegetable farmers using water from the dam at Chipapa near Lusaka is worthy of mention. Contact has also been maintained with the Chirundu Sugar Estates on the south bank of the Zambezi where cane is being grown commercially under overhead spray irrigation.

Ecology and Grassland Management

77. Studies of seasonal yield and variation in the composition of natural grazing were carried out at Mount Makulu. It has been shown that although the crude protein content of grassland is high from the commencement of the rains until the end of December, the yield per acre is low because the bulk produced is low. Investigations into the effect of mowing in the latter part of the rains, burning to achieve an " early bite ", fertilising and spike rolling and studies of the growth and composition of individual veld species are providing information which will be of the greatest value in evolving systems of grassland management: this is a subject of fundamental importance to farming in Northern Rhodesia upon which we are woefully ignorant. The outstanding analyses of *Cynodon dactylon* and *Urochloa pullulans* are worth noting. Trials with fertilisers, irrigation and seed production under varying treatments are yielding valuable information.

Plant Breeding

Groundnuts

78. Varietal studies of groundnuts have been carried out at Mount Makulu, Monze and Petauke. An imported variety from Australia, *Mani pintar*, produced the phenomenal yield at Mount Makulu of 2,192 lb. of kernels per acre. Trials with fungicides against leaf spot and cultural trials showed no significant differences in yield between treatments and control.

Beans

79. Twenty-five strains of the sugar bean *Phaseolus vulgaris* were tested for yield and disease resistance. The average yield of seed over the trial was of the order of 750 lb. per acre with 1,250 lb. per acre from the best variety. Bean rust, angular leaf spot and halo blight were

studied and also three major insect pests. The dwarf variety of lima bean, *Phaseolus lunatus*, showed drought resistance and good yielding capacity. The Hernon strain of soya bean yielded 975 lb. per acre at Mount Makulu: a yield of 1,400 lb. per acre of this variety was recorded in a trial at Serenje.

Wheat

80. Summer wheat at Mount Makulu suffered considerably from attacks of *Helminthosporium sativum* and from weed competition. All yields were extremely low. December planting was shown to be the best for summer wheat, and significant responses were shown to potash. Termite damage was effectively controlled by dressing seed with Shell Dieldrex A, and by soil treatment with granular ortho-aldrin and Aldrin wettable powder at the rate of four pounds per acre. Promising single plant selections from a Kenya variety were retained for further study, and a cross was made locally between the varieties Kentana 52A × Nigerian AC.

81. Winter wheat sown with irrigation at Mount Makulu showed considerable promise, and six varieties in a yield trial returned between 2,000 and 2,500 lb. of grain per acre.

Sorghum

82. A collection of local varieties of sorghums was compared with a number of introduced varieties in observation plots. The introduced early maturing varieties yielded generally better than the local late maturing varieties which were badly affected by stalk-borer, lack of late rains and severe bird damage. Aphid attack caused a considerable reduction in yield in a number of sweet sorghums grown as potential fodder crops.

Millet

83. Collections of finger millet and bulrush millet varieties were made and some thirty-six types were compared in observation plots. Finger millets yielded well and were remarkably free from disease. Potential yields were of the order of eight bags per acre. Bird damage was the limiting factor in bulrush millet except in two varieties which were bearded. The beardless varieties appeared to have the highest yield potential, however.

Cassava

84. Hybrid seed of mosaic-resistant varieties was received from Amani in Tanganyika and young plants were established for future testing, while cuttings of selected mosaic-free plants received from infected areas in the Central Province and Barotseland were raised for testing and multiplication.

Maize Agronomy

85. Studies of varying spacing between and within rows of maize with 15,000 plants per acre showed no significant yield differences. Trials carried out using nitrogen in varying forms for top dressing, namely sulphate of ammonia, nitrate of soda, nitroline, urea and farmyard manure on an equivalent nitrogen basis, showed no significant differences. It was noted, however, that cut-worm in the farmyard manure reduced plant population in six plots which were dressed with it. Trials with the herbicides 2-4D, MCPA and CDAA combined with cultivations showed clearly that the benefits of herbicides are equivalent to one cultivation. The trial reaffirmed a previous conclusion to the effect that cultivation under Northern Rhodesian conditions has a function in soil amelioration additional to weed control. It is suggested that on lighter soils the results of cultivation might not be so marked as they are on the red loams at Mount Makulu.

Turkish Tobacco Trials

86. Statistically laid out trials with Turkish tobacco to test various spacings, fertiliser treatments and varieties were carried out at five centres—Kalomo, Muswishi (near Broken Hill), Petauke, Lundazi and Balovale. The statistical analyses of these trials have not yielded as much information as expected, and perhaps their biggest value has been in giving experience to the field staff. The interaction of spacing and fertility levels, both inherent and due to fertiliser applications, was shown to be very marked. Varying quantities of potash and phosphate in relation to fixed nitrogen applications did not markedly affect either yield or quality.

87. Two types of tobacco were grown, Seluk and Samsun. Only one variety of Seluk was tested against the two varieties of Baffra and Djanik of the Samsun type. Samsun varieties received on the average 10 per cent. more in price than Seluk. At Kalomo the yields of Seluk and Samsun were more or less the same, but at Lundazi the Samsun varieties yielded very much better than Seluk. Further trials will be necessary with this crop in the future.

Plant Pathology

88. The Plant Pathologist has been kept very fully occupied during the year with a wide range of activities which have included the identification of plant diseases and the compilation of disease records, advisory services to other officers and to the public, and a certain amount of research. Diseases of wheat, particularly *Helminthosporium sativum*, appeared to be building

up and require constant observation. Black rot in cabbages in the wet season, mildew on peas and late blight in potatoes are common diseases requiring attention. Eelworm problems are important and caused considerable though unestimated losses in crop production. Four species of eelworm were identified during the year. An identification of *Chirothrips sp.* attacking barley and oats grown under winter irrigation on the Rhodesian Selection Trust polder, and at Chiansi, in epidemic proportions raised problems for the future development of these crops on a large scale. An experiment was carried out to test the effect of *Cercospora* leaf spot on the yield of groundnuts. The results were not significant with *Mwitunde*, the variety selected for the trial, which appears to possess good field resistance. The effect of dithane fungicide for the control of rust on summer wheat was investigated in collaboration with the Plant Breeder. Four wheat varieties showed fair resistance by visual observation, although the differences were not reflected in yield. Agrosan mercurial seed dressing was used effectively to control " black point ", a fungus disease of wheat. No significant results emerged from an experiment designed to study the effects of pruning, staking and fungicide treatment on the yield of tomatoes grown as a summer crop due to factors other than treatments.

Agricultural Chemistry

89. The chemical analyses of soil samples and herbage materials constitute a major activity of the chemistry section; 2,000 soil samples and 1,600 herbage samples were analysed during the year. Laboratory techniques were ingeniously streamlined to cope with the volume of this work. Other materials analysed included bat guano, milk, ensilage, boiler scale, salt licks, wood and water samples. Pot trials employing the " Kawanda " technique developed in Uganda were carried out with soils from the Kafue Flats and Balovale, using tomato, turnips and tobacco as the test plants. Nitrogen, phosphorus and boron were shown to be lacking from the Kafue Flats soils, and nitrogen, phosphorus and to a lesser extent potassium and molybdenum from those from Balovale. A comprehensive study of physical data collected from the Chiansi experiment station on the Kafue Flats was commenced during the year, including the height of water table and rates of evaporation, determinations of permeability and infiltration rates, leaching trials and cultivation tests using water of differing qualities.

FARM DEVELOPMENT, MOUNT MAKULU

90. Field experimentation at Mount Makulu was fitted into the background of a normal mixed farm as far as possible, which includes a dairy herd of forty grade Jerseys. Stock were fed as far as possible on home-grown feeds. Milk receipts totalled over £3,000 for the year. The herd suffered a serious setback from an outbreak of contagious abortion which resulted in the loss of thirteen calves. A small flock of sheep was maintained largely as grazing animals for the pasture research section. Ninety-five sheep were made available to the Rhodesia and Nyasaland University farm for research purposes. A decision was reached during the year to acquire a nucleus herd of indigenous Ngoni cattle for beef production in connection with grazing trials.

91. A weir was constructed on Makulu Stream on the northern boundary of the farm to facilitate irrigation. Grass fires continued to be a problem, fire breaks around the station proved ineffective. Buildings received attention, three European houses were completed during the year and ten African assistants' houses were constructed.

CONFERENCES, BOARDS AND COMMITTEES

92. Officers of the department have continued to play a full part during the year as members of official boards and committees. In one capacity or another the department is represented upon the following:

Natural Resources Board.
Maize Control Board.
Copperbelt Special Area Committee.
African Farming Improvement Fund Committee.
Eastern Province Agricultural Produce Board.
Southern African Regional Committee for Conservation and Utilisation of the Soil.
Federal Interim Grain Marketing Committee.
Federal Standing Committee on Agricultural Production.
Federal Marketing Council.
Federal Research Committee.
Water Board.

LEGISLATION

93. The following *Gazette* and Government Notices affecting the department were published:

General Notice No. 467 of 1957—Appointment to the Legislative Council, Mr. C. W. Lynn, M.B.E.
General Notice No. 581 of 1957—Membership of the Water Board.
General Notice No. 1032 of 1957—Membership of the Maize Control Board.
General Notice No. 1111 of 1957—Price of African-grown Maize.

General Notice No. 1121 of 1957—Membership Eastern Province Agricultural Produce Ordinance—Eastern Province Agricultural Produce Board.

General Notice No. 1261 of 1957—African Farming Improvement Funds Bill, 1957.

General Notice No. 1806 of 1957—Conservation of Natural Resources—Subsidies on Water Conservation Works.

General Notice No. 1803 of 1957—The Eastern Province Agricultural Produce (Repeal) Bill, 1957.

Government Notices:

Government Notice No. 160 of 1957—Eastern Province Agricultural Produce Ordinance, Producer Price of Maize.

Government Notice No. 161 of 1957—Producer Price of Groundnuts.

Ordinances enacted:

No. 6 of 1957—Maize Control (Amendment) Ordinance, 1957.

No. 16 of 1957—The Eastern Province Agricultural Produce (Amendment) Ordinance, 1957.

Bills:

General Notice No. 1261 of 1957—African Farming Improvement Funds.

PUBLICATIONS

94. The following departmental Bulletins and Reports were published throughout the year:

Bulletin No. 2 of 1951—*Intensive Vegetable Growing for Africans*, by B. C. Wills, Agricultural Officer—Reprinted.

Report of the Ngoni Land Utilisation Survey, 1954–1955, by M. J. S. W. Priestley, District Officer, and P. Greening, Agricultural Officer—With coloured plates and photographs—Government Printer, Lusaka—Price 25*s*.

Leaflet—*The Importance of Soil Survey and Mapping in Northern Rhodesia*, by Dr. A. O. Ballantyne, Soil Surveyor.

VISITORS

95. Professor A. G. Davis, Professor of Agriculture, University College of Rhodesia and Nyasaland.

Dr. Ypsilanti, Klipfontein Organics Corporation, near Pretoria.

Mr. G. M. Roddan, C.M.G., Deputy Agricultural Adviser, Colonial Office, London.

Mr. A. C. Venn, Soil Fertility Worker, Department of Agriculture, Basutoland.

Lt.-Col. V. H. Holt, The Holt Weed Breaker Company, York, England.

Sir Gilbert Rennie, C.B.E., K.C.M.G., M.C., High Commissioner for Rhodesia and Nyasaland, London.

Messrs. A. S. Valentine (Provincial Agriculturist) and T. A. Murton (Agriculturist), Department of Native Agriculture and Land Husbandry, Salisbury, Southern Rhodesia.

His Excellency the Acting Governor-General and Lady Murphy, Salisbury.

Mr. M. R. Metcalf, C.M.G., O.B.E., and Mrs. Metcalf, High Commissioner for the United Kingdom, Salisbury.

Sir Frank Engledow, C.M.G., M.A., F.R.S., Retired Drapers' Professor of Agriculture, Cambridge.

Professor M. J. Herskovits, Director of African Studies, North-Western University, Evanston, Illinois, U.S.A.

Mr. J. C. Jones, Assistant Education Adviser (Technical) to the Secretary of State.

Mr. Austin Albu, M.P., and Mr. D. L. Anderson, C.B.E., T.D.

Dr. Herbert Greene, Adviser on Tropical Soils, Rothamsted Experimental Station, Harpenden, Herts., England.

Mr. C. G. Ligthart, United Nations Secretariat.

Mr. A. R. Thomas, C.M.G., Assistant Under Secretary of State, Colonial Office, London.

Mr. Nigel Heseltine, Agricultural Division, F.A.O., Rome.

His Excellency the Governor-General and Lady Dalhousie, Salisbury.

Dr. Thelma A. Dreis, United States Department of Agriculture.

IN CONCLUSION

96. I would like to record my appreciation to all members of the staff of the department for an excellent year's work.

C. W. Lynn,
Director of Agriculture.

25th February, 1958.

APPENDIX I

DEPARTMENT OF AGRICULTURE

Staff position as at 31st December, 1957.

Post	*Establishment*	*Vacancies*
Director	1	—
Deputy Director	1	—
Assistant Director	1	1
Agricultural Economist	1	—
Secretary	1	—
Assistant Tobacco Adviser	1	—
Chief Agricultural Officers	3	1
Agricultural Officers	33	2
Conservation Officers (Planning)	2	1
Principal Agricultural Supervisors	6	—
Agricultural Supervisors	49	2
Agricultural Supervisors (Supernumerary—Gwembe Valley Resettlement Scheme)	3	—
Conservation Supervisor	1	1
Chief Research Officer	1	—
Ecologist	1	—
Agricultural Chemists	2	—
Soil Chemist	1	—
Soil Surveyor	1	—
Plant Breeders	2	—
Plant Pathologist	1	—
Pasture Research Officer	1	—
Entomologist	1	—
Assistant Professional Officer	1	—
Farm Superintendent	1	—
Research Assistants	5	1
Assistant Technical Officers	3	2
Building Foreman (Seconded)	1	1
Mechanic (Seconded)	1	—
Accountants	3	—
Clerks—Male	8	—
Clerks—Female	13	1

AFRICAN STAFF

Clerks	56	3
Agricultural Assistants	308	44
Survey Assistants	11	2
Laboratory Assistants	6	1
Head Agricultural Capitaos	24	2
Senior Agricultural Capitaos and Agricultural Capitaos	293	42
Senior Orderlies and Orderlies	82	5
Bricklayer	1	—
Carpenters	6	2
Chauffeurs	8	1
Drivers	19	5
Station Handymen	8	4
Telephone Operator	1	—

APPENDIX II

STAFF LIST AS AT 31st DECEMBER, 1957

HEADQUARTERS, LUSAKA

C. W. Lynn, M.B.E., DIP. AGRIC. (WYE), A.I.C.T.A., Director.
C. E. Johnson, B.SC., DIP. AGRIC. (CANTAB.), A.I.C.T.A., Deputy Director.
N. M. W. Irvin, Secretary.
G. B. Emslie, Assistant Tobacco Adviser.
N. N. Robertson, Accountant.
J. Meade, Accountant.
H. de B. Barwis, Accountant.
D. A. Grobecker, Clerk.
K. D. Ransom, Clerk.
A. B. C. Collocott, Clerk.
Miss G. M. N. Briggs, Stenographer.
Miss B. G. Wyatt, Stenographer.
Miss E. Leach, Stenographer.

Mrs. C. J. Gourdie, Registry Clerk.

Mrs. S. C. Woolley, Assistant Registry Clerk.

Mrs. A. J. Ketchell, Temporary Clerk (Accounts).

SPECIALIST SERVICES

J. Wilson, B.SC. (BOTANY), Chief Research Officer, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Agronomy:

T. H. Bosse, M.SC., B.SC., Agricultural Officer, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

R. B. Symington, B.SC., D.T.A., Agricultural Officer. (On leave.)

Chemistry:

J. B. M. Vogt, B.SC. (CHEMISTRY), Agricultural Chemist, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

K. L. H. Dubber, Research Assistant, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

F. P. Geddes, Research Assistant, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

J. K. McPhillips, Nat. Cert. (Chem.), Research Assistant, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

P. F. Gibbon, A.I.S.T., Research Assistant, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

J. H. Remba, Scale " C " Laboratory Assistant.

Pasture Research:

N. R. Brockington, B.SC. (BOT. LONDON), DIP. AGRIC. SC. (CANTAB.), Ecologist, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

T. Davies, B.SC., Agricultural Supervisor, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Plant Pathology:

A. Angus, B.SC., Plant Pathologist, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Miss M. L. Lister, B.SC., Research Assistant. (On leave pending resignation.)

Land Use Survey:

A. O. Ballantyne, B.SC., PH.D., Soil Surveyor, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

R. Webster, B.SC., M.SC., Soil Chemist, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

G. A. Perfect, Agricultural Supervisor, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

W. C. Verboom, DIP. AGRIC., Conservation Officer (Planning), Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

P. G. Jones, Agricultural Supervisor, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

O. Lundwe, Scale " C " Agricultural Assistant, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Farm Management:

T. J. Greatrex, Farm Superintendent, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Plant Breeding:

B. E. Mounter, B.SC., Plant Breeder (Wheat), Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

J. Smartt, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Plant Breeder (General). (On leave.)

E. H. K. Mudenda, B.SC., B.A., Assistant Professional Officer, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Machinery and Plant:

A. W. Robinson, Mechanic (Seconded), Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Administration:

K. G. Walker, Clerk, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Miss M. Booth, Clerk, Central Agricultural Research Station, P.O. Box 7, Chilanga, Lusaka.

Mrs. R. J. Cobley, Clerk. (On leave.)

Special Investigations—Kafue Flats:

J. R. E. Hindson, B.A., A.I.C.T.A., Senior Agricultural Officer, Lusaka.

H. Balfoort, DIP. AGRIC., Agricultural Supervisor, Chiansi.

Entomology:

Miss K. F. Salmond, B.SC., D.I.C., PH.D., Entomologist, seconded to Maize Control Board, Lusaka.

African Laboratory Assistants: 6
African Agricultural Assistants: 6
African Agricultural Capitaos: 7

SOUTHERN PROVINCE

R. B. Reid, B.SC., N.D.A., Chief Agricultural Officer, Choma.
A. M. Donaldson, Agricultural Supervisor, Choma.
A. S. Heaton-Smith, N.D.A., C.D.A., Agricultural Supervisor, Mapanza.
D. H. Bezuidenhout, Clerk, Choma.
Mrs. G. von Horsten, Clerk, Choma.
J. E. Mansfield, B.SC. (WYE), DIP. AGRIC. (READING), Agricultural Officer, Monze.
I. L. Edwards, Principal Agricultural Supervisor, Monze.
K. D. Reed, N.D.A., C.D.A., DIP. FARM. MAN., Agricultural Supervisor, Monze.
J. Matheson, N.D.D., N.D.A., Agricultural Supervisor, Monze.
I. C. M. Patterson, Agricultural Supervisor, Monze.
B. J. O'N. Shepherd, Principal Agricultural Supervisor, Monze Agricultural Training School, Monze.
J. P. Parmiter, D.S.C., B.SC. (AGRIC.), Agricultural Officer, Kalomo.
E. G. Dabinett, Principal Agricultural Supervisor, Kanchomba.
J. A. H. Smith, Agricultural Supervisor, Magoye.
J. S. D. M. Johnstone, M.B.E., Agricultural Supervisor, Mapangazia.
A. R. MacLachlan, Agricultural Supervisor. (On leave.)
S. F. Kandunda, Scale " C " African Clerk, Choma.
African Agricultural Assistants: 76
African Agricultural Capitaos: 55

GWEMBE VALLEY RESETTLEMENT SCHEME

C. S. Mitchell, Principal Agricultural Supervisor, Gwembe.
G. D. Nicholson, C.D.A., Agricultural Supervisor, Gwembe.
D. K. R. Bray, Agricultural Supervisor, Mwemba.
T. R. A. Witting, Agricultural Supervisor, Changa.
P. A. Johnstone, DIP. AGRIC., Agricultural Supervisor, Sinazongwe.

CENTRAL PROVINCE

B. L. Batwell, B.SC., Agricultural Officer, Broken Hill.
D. T. Harwood, C.D.A., Agricultural Supervisor, Broken Hill (Rural).
T. Dixon, Clerk, Broken Hill.
Mrs. S. Langley, Temporary Clerk, Broken Hill.
J. Armstrong, B.A., D.T.A., Agricultural Officer, Mumbwa.
H. L. M. Hewitt, Agricultural Supervisor, Mumbwa.
N. W. Smyth, B.A., B.SC., Agricultural Officer, Serenje.
A. F. Nicoll, Agricultural Supervisor, Serenje.
J. G. Edwards, B.SC., D.T.A., Agricultural Officer, Chalimbana. (Soli Reserve.)
J. H. S. Perioli, Agricultural Supervisor, Chalimbana. (Soli Reserve.)
G. N. Ball, Agricultural Supervisor, Sala Reserve.
A. P. Lowe, DIP. AGRIC., Agricultural Supervisor, Mukulaikwa.
R. Simms, Agricultural Supervisor, Mkushi.
Richard Nyirenda, B.E.M., Assistant Technical Officer, Keembe.
H. H. Roberts, B.SC. (AGRIC.), Agricultural Officer. (On leave.)
C. J. McK. Krige, B.SC. (AGRIC.), Chief Agricultural Officer. (On leave pending retirement.)
African Agricultural Assistants: 45
African Agricultural Capitaos: 37.

EASTERN PROVINCE

F. Durocher-Yvon, M.B.E., DIP. AGRIC., Agricultural Officer, Fort Jameson.
F. Gardiner, Clerk, Fort Jameson.
Mrs. H. A. Schallenberg, Temporary Clerk, Fort Jameson.
P. Greening, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer. (On leave.)
W. A. Denchfield, Principal Agricultural Supervisor, Fort Jameson. (Ngoni Areas.)
M. H. Rosser, DIP. AGRIC., Agricultural Supervisor, Fort Jameson.
R. N. Coster, B.SC., D.T.A., Agricultural Officer, Petauke.
M. J. Mansfield, Agricultural Supervisor, Petauke.
A. H. Farncombe, Agricultural Supervisor. (On leave.)
J. D. Minchinton, Agricultural Supervisor, Kalichero.
P. W. P. Madge, Agricultural Supervisor, Chadiza.
P. J. Fisher, Agricultural Supervisor, Katete.
W. F. v.d. B. Morkel, B.SC., D.T.A., Agricultural Officer, Lundazi.
T. D. Quiery, Agricultural Supervisor, Lundazi.
J. Thomson, Agricultural Supervisor. (On leave.)
African Agricultural Assistants: 56.
African Agricultural Capitaos: 116.

WESTERN PROVINCE

F. J. Smart, B.A., DIP. AGRIC. (CANTAB.), A.I.C.T.A., Agricultural Officer, Ndola.
J. S. Blacklock, DIP. AGRIC., C.D.D., A.I.C.T.A., Agricultural Officer. (On leave.)
R. M. Wood, Agricultural Supervisor, Ndola (Rural).

D. F. Wallace, Agricultural Supervisor, Ndola (Rural).
P. W. Lake, Agricultural Supervisor. (On leave.)
Mrs. W. G. Tanner, Temporary Clerk, Ndola.
African Agricultural Assistants: 10.
African Agricultural Capitaos: 13.

Northern Province

A. T. Wilson, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer, Kasama.
W. J. R. Boyd, B.SC., D.T.A., Agricultural Officer, Kasama.
J. M. Frew, Principal Agricultural Supervisor, Kasama.
G. McI. Burnie, Agricultural Supervisor, Kasama.
N. B. Matthews, Clerk, Kasama.
Mrs. D. H. Bowers, Temporary Clerk, Kasama.
C. D. Slater, N.D.A., DIP. AGRIC., Agricultural Supervisor, Chinsali.
H. B. C. Jones, M.A., Agricultural Officer, Lunzuwa.
J. H. Alder, Agricultural Supervisor, Lunzuwa.
J. J. Turner, Agricultural Supervisor, Lunzuwa Agricultural Training School, Lunzuwa.
A. C. Downer, N.D.A., C.D.A., Agricultural Supervisor, Isoka.
A. R. Fraser, Agricultural Supervisor, Luwingu.
D. R. Mackay, B.SC., D.T.A., Agricultural Officer, Fort Rosebery.
P. M. McIntyre, Agricultural Supervisor, Fort Rosebery.
O. R. Tennant, Agricultural Supervisor, Kawambwa.
B. Kapota, Scale " C " Agricultural Assistant, Lunzuwa.
African Agricultural Assistants: 76.
African Agricultural Capitaos: 55.

North-Western Province

J. H. Rhodes, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer, Solwezi.
E. L. de S. Mason, DIP. AGRIC., Agricultural Supervisor, Solwezi.
D. M. Miller, N.D.A., Agricultural Supervisor, Solwezi.
P. T. L. Kohler, DIP. AGRIC., Agricultural Supervisor, Kabompo.
P. A. Henderson, Agricultural Supervisor, Kasempa.
P. Devonald, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer, Balovale.
A. W. Gow, Agricultural Supervisor, Balovale.
African Agricultural Assistants: 20.
African Agricultural Capitaos: 24.

Barotseland Protectorate

J. A. Allan, B.SC. (AGRIC.), Agricultural Officer, Mongu.
M. W. Singer, DIP. AGRIC., Agricultural Supervisor, Mongu.
V. W. Meyer, Agricultural Supervisor, Mongu.
E. R. Woollard, DIP. HORTICULTURE, Mankoya.
African Agricultural Assistants: 23.
African Agricultural Capitaos: 25.

Black front
? Cladosporium

[Riley (P.A.)] Sept 1554. dated 1555

8/55